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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO
10/630,744	07/31/2003	Hiroto Yukawa	2003-1079	9935

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WENDEROTH, LIND & PONACK, L.L.P.
2033 K STREET N. W.
SUITE 800
WASHINGTON, DC 20006-1021

EXAMINER	
LEE, SIN J	

ART UNIT	PAPER NUMBER
1752	

DATE MAILED: 10/26/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/630,744	YUKAWA ET AL.	
	Examiner	Art Unit	
	Sin J. Lee	1752	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 August 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *8-17 and 20-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *8-17 and 20-22* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☒ Certified copies of the priority documents have been received in Application No. 10126673.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Applicants canceled claims 18 and 19 in the amendment filed on August 16, 2004.

2. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Claim Rejections - 35 USC § 103

3. Claims 8-13, 17 and 20-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takemura et al (5,759,739) in view of Yoshimoto et al (EP 0 540 032 A1) and Suwa et al (6,187,504 B1).

Takemura teaches (col.1, lines 10-12, col.2, lines 27-35, lines 49-67, col.3, lines 1-9, col.6, lines 53-55) a positive resist composition of chemically amplified type

comprising an alkali-soluble resin, a dissolution inhibitor of the formula (2) or (3), a photoacid generator, and *an organic solvent.*

The chemical formula for Takemura's photoacid generator is $(R^1)_nMX$ wherein M is *sulfonium or iodonium*, and X is p-toluenesulfonate or *trifluoromethanesulfonate* (see col.2, lines 40-48). Since there are only two choices for 'X", one of ordinary skill in the art would immediately envisage X to be *trifluoromethanesulfonate anion.* Therefore, the prior art teaches *present acid-generating compound which is an onium salt compound having a fluoroalkylsulfonate as the anionic constituent.*

Since Takemura teaches that his dissolution inhibitor is represented by the formula (2) or (3), one of ordinary skill in the art would immediately envisage using the dissolution inhibitor of formula (2) in Takemura's composition. Takemura teaches (col.5, lines 36-65, col.6, lines 39-45) that their dissolution inhibitor of formula (2) can be readily prepared by copolymerizing hydroxystyrene, substituted or unsubstituted styrene, t-butyl (meth)acrylate, and (meth)acrylic acid at a molar ratio of m:x:y:z (wherein m or z can be zero). Based on this teaching, one of ordinary skill in the art would immediately envisage Takemura's dissolution inhibitor being a copolymer of hydroxystyrene, unsubstituted styrene, *t-butyl (meth)acrylate* (since the molar ratio z for the (meth)acrylic acid monomer unit can be zero). Therefore, the prior art teaches *present copolymeric resin of claim 8 consisting of the monomeric units of hydroxystyrene, styrene, and tert-alkyl (meth)acrylate.* As to the amount of each monomeric units of the copolymeric resin, in col.5, lines 36-65, Takemura teaches that $0.3 \leq m \leq 0.7$, $0 < x \leq 0.9$, and $0 < y \leq 0.9$ (i.e., *30-70 mol %* for the hydroxystyrene monomer

unit, *greater than 0 mol % and equal or less than 90 mol %* for the substituted or unsubstituted styrene monomer unit, and *greater than 0 mol% and equal or less than 90 mol%* for the t-butyl (meth)acrylate monomer unit). Since these ranges overlap with present ranges of claim 8, the prior art's teaching would render present ranges of claim 8 *prima facie* obvious. In the case "where the [claimed] ranges overlap or lie inside ranges disclosed by the prior art," a *prima facie* case of obviousness would exist which may be overcome by a showing of unexpected results, In re Wertheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976). Therefore, the prior art teaches the present film-forming resinous compound of claim 8 having acid-dissociable solubility-reducing groups in the molecule and capable of being imparted with an increased solubility in an aqueous alkaline solution by interacting with an acid (*since the prior art teaches present copolymeric resin*).

As to the presently claimed amount for the present components (A) and (B), Takemura teaches (col.6, lines 46-48 and col.5, lines 1-3) that their dissolution inhibitor is used in the amount of 7-40% by weight of the total weight of their components in the composition and that their photoacid generator is used in the amount of 0.5-15% by weight of the total weight of their components in the composition. Assuming that one uses 40% by weight of the dissolution inhibitor (because 40% by weight is disclosed as the higher end of the taught range), converting the amount of 0.5-15% by weight of Takemura's photoacid generator based on 100% by weight of Takemura's dissolution inhibitor would give *1.25-37.5% by weight* of Takemura's photoacid generator based on 100% by weight of Takemura's dissolution inhibitor. Since this range overlaps with

present range of 1-20 parts by weight of the acid generating compound (B), the prior art's teaching would render present range *prima facie* obvious. See In re Wertheim, supra. Therefore, Takemura teaches present components (A) and (B) of claim 8.

With respect to present component (C), Yoshimoto et al, a prior art which teaches a positive type photoresist composition comprising a resin having anti-alkali dissolution groups in the molecules (which becomes alkali soluble by a reaction with acid) and a photoacid generating compound, teaches in pg.3, lines 16-24 that the adhesiveness of a resist to a substrate is markedly improved by adding organic phosphorus acid compound to the photoresist composition in an amount of 0.001 to 10% by wt (based on the weight of the resin). As *preferred* examples for the organic phosphorus compound, Yoshimoto teaches (pg.9, lines 43-45) phenylphosphinic acid as well as phenylphosphonic acid (see Table 1 on pg.16). Since Takemura teaches (col.9, lines 25-28) that their resist compositions are coated on a silicon substrate and since Yoshimoto also teaches a silicon substrate (see pg.10, lines 15-16), it would have been obvious to one of ordinary skill in the art to add an organic phosphorus acid compound such as phenylphosphinic acid or phenylphosphonic acid to Takemura's photoresist composition in order to improve the adhesiveness of the resist to the substrate as taught by Yoshimoto et al. Also, since the taught amount for the phosphorus acid compound to be added overlaps with the presently claimed ranges (0.01 to 5 parts by wt. of claim 8 and 0.1 to 2.0 parts by weight of claim 21), the prior art range would have made the present ranges *prima facie* obvious. In re Wertheim, supra.

Therefore, Takemura in view of Yoshimoto would render obvious present component (C) of claim 8.

With respect to present component (D), Suwa et al, a prior art which teaches (col.2, lines 14-55) a positive-tone radiation sensitive resin composition comprising a photoacid generator, alkali-soluble resin and an alkali solubility control agent, teaches (col.28, lines 30-58) the use of a Lewis base additive (which exhibits an action as a Lewis base to the acid produced from the acid generator) such as nitrogen-containing basic compounds in order to improve perpendicularity of resist pattern side walls. Since Takemura's photoresist composition also comprises a photoacid generator, it would have been obvious to one of ordinary skill in the art to add a nitrogen-containing basic compound to Takemura's resist composition in order to improve perpendicularity of resist pattern side walls as taught by Suwa et al. As examples for the nitrogen-containing basic compounds, Suwa et al teach amine compounds, imidazole compounds, pyridine compounds and nitrogen-containing heterocyclic compounds, and Suwa et al include triethylamine, tributylamine, as well as triethanolamine as more specific examples for the amine compound. It would have been obvious to one of ordinary skill in the art to add triethylamine, tributylamine, or triethanolamine into Takemura's resist composition with a reasonable expectation of obtaining the improved perpendicularity of resist pattern side walls as taught by Suwa et al. Therefore, Takemura in view of Suwa would render obvious present component (D) of claim 8 (since Suwa teaches (col.28, lines 59-61) the amount of the Lewis base additive, *which exhibits an action as a Lewis base to the acid produced from the acid generator* to be

0.05-1 mol for 1 mol of the acid generator, it is the Examiner's position that the prior art teaches the use of present component (D) in an amount sufficient to exhibit an acid-quenching effect).

With respect to present limitation "a positive-working chemical-amplification photoresist composition which ***consists essentially of***: (A) . . . ; (B) . . . ; (C) . . . , (D) . . ., and (E) . . .", the Examiner acknowledges that Takemura's composition includes an *alkali-soluble resin* in addition to the dissolution inhibitor (which teaches present component (A)) and the photoacid generator (present component (B)). However, it is the Examiner's position that the presence of Takemura's alkali-soluble resin *does not* materially affect the basic and novel characteristics of the presently claimed invention: As one of the preferred example of the alkali-soluble resin, Takemura teaches polyhydroxystyrene in which come hydroxyl groups are replaced by t-butoxycarbonyl groups (see col.5, lines 17-24). Such resinous compound is also mentioned in present specification (pg.6, second full paragraph) as one of the particular examples for the resinous compounds suitable as the present component (A) (besides, present specification states (pg.7, first full paragraph) that it is optional that the component (A) is a combination of two kinds of more of those resinous compounds listed on pg.6-7)). Thus, it is the Examiner's position that the presence of Takemura's alkali-soluble resin would not materially affect the basic and novel characteristics of the presently claimed invention. Therefore, it is the Examiner's position that Takemura in view of Yoshimoto and Suwa still teaches present positive-working chemical-amplification photoresist composition of claim 8 which *consists essentially of* (A)-(E). In MPEP 2111.03, it is

stated that the transitional phrase "consisting essentially of" limits the scope of a claim to the specified materials or steps "*and those that do not materially affect the basic and novel characteristic(s)*" of the claimed invention. In re Herz, 537 F.2d 549, 551-52, 190 USPQ 461, 463 (CCPA 1976).

Takemura spin-coats his resist composition solution on a *silicon substrate* (present semiconductor wafer of claim 12) and pre-bake it at 100°C on a hot plate for 2 minutes to form a dried resist film. Then, by using a KrF excimer laser, a pattern is drawn on the resist film. After that, the resist film is developed to obtain a positive pattern (see Example 1). Therefore, Takemura in view of Yoshimoto et al and Suwa et al would render obvious present inventions of claims 8, 9, 12, 13, 17, and 20-22.

With respect to present claims 10 and 11, Takemura teaches (col.2, lines 37-40) that his positive resist composition is highly sensitive to high-energy radiation such as deep UV rays, electron rays, and X rays. Therefore, one of ordinary skill in the art would immediately envisage using electron rays or X rays in Takemura's imagewise exposure step. Therefore, Takemura in view of Yoshimoto and Suwa would also render obvious present inventions of claims 10 and 11.

4. Claims 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takemura et al (5,759,739) in view of Yoshimoto et al (EP 0 540 032 A1) and Suwa et al (6,187,504 B1) as applied to claim 12 above, and further in view of applicants' admitted prior art (pg.3 of present specification).

As discussed above in Paragraph 3, Takemura applies his resist composition solution on a *silicon substrate* (present semiconductor wafer of claim 12). In the first full

paragraph of pg.3 of present specification, applicants admit that it is *usual* that the photoresist layer is formed not directly on the surface of a semiconductor silicon wafer but on the surface of a thin undercoating film of materials, which examples include phosphosilicate glass, borosilicate glass, borophosphosilicate glass, SiN, Si_3N_4, and SiON. Therefore, it would have been obvious to one of ordinary skill in the art to coat Takemura's silicon substrate with a thin undercoating film of materials (such as phosphosilicate glass, borosilicate glass, borophosphosilicate glass, SiN, Si_3N_4, or SiON) before applying his resist composition solution because it is an usual practice in the art to do so as admitted by applicants. Therefore, Takemura et al in view of Yoshimoto et al and Suwa et al, and further in view of applicants' admitted prior art would render obvious present inventions of claims 14-16.

Response to Arguments

5. Applicants point out that Takemura's composition includes two kinds of different resinous ingredients (an alkali-soluble resin and a dissolution inhibitor) whereas the present composition contains a single type of resinous ingredient as the film-forming base resin. Applicants also state that their claim language now employ "consisting essentially of" terminology which excludes employing both a film-forming resinous compound and a dissolution inhibitor and the "consisting of" terminology for the resin component (A) which requires a single type of resin as defined in claim 8.

However, present claim language does not require a positive-working chemical-amplification photoresist composition which ***"consists of"*** (A)-(E). Thus, it does not necessarily exclude Takemura's alkali-soluble resin. As discussed above, in Paragraph 3, MPEP states that the transitional phrase "consisting essentially of" limits the scope of

a claim to the specified materials or steps "*and those that do not materially affect the basic and novel characteristic(s)*" of the claimed invention, and for the reasons explained above in Paragraph 3, the presence of Takemura's alkali-soluble resin *would not* materially affect the basic and novel characteristics of the presently claimed invention. Thus, in this case, the present claim language "consisting essentially of" does not exclude employing both of Takemura's alkali-soluble resin and the dissolution inhibitor.

Applicants furthermore argue that *even though Takemura's general formula (2) for dissolution inhibitor may generically encompass component (A) of present invention*, those skilled in the art would not be motivated to replace the dissolution inhibitor of Takemura with the base resin of the component (A) herein unless they attempted to reconstruct the present invention by relying on Applicants' disclosure since a dissolution inhibitor and a base resin work in very different ways as ingredient in photoresist composition.

However, one would only be motivated to replace the dissolution inhibitor of Takemura with the base resin of the component (A) when he/she concludes that Takemura's dissolution inhibitor does not teach present film-forming resinous compound having acid-dissociable solubility-reducing groups in the molecule and capable of being imparted with an increased solubility in an aqueous alkaline solution by interacting with an acid. Takemura's dissolution inhibitor, *as explained above*, teaches present copolymeric resin consisting of hydroxystyrene, styrene, and tert-butyl (meth)acrylate, and also renders present ranges for the amount of each monomeric units prima facie obvious. Therefore, Takemura's dissolution inhibitor, which is polymeric resin, teaches

present film-forming resinous compound having acid-dissociable solubility reducing group in its molecule and capable of being imparted with an increased solubility in an aqueous alkaline solution by interacting with the acid. Even applicants admit that Takemura's general formula (2) for dissolution inhibitor may generically encompass component (A) of present invention.

Applicants argue that the present claims are unobvious over Takemura even in combination with the secondary references, especially now that the resin (A) of claim 8 is amended relative to the molar fractions of the respective monomeric units. Applicants also argue that it is not apparent why one of ordinary skill in the art would modify Takemura to discard its firm-forming resin component (B) or perhaps dissolution inhibitor component (C) and include the phosphorus-containing oxoacid of Yoshimoto and further include the Lewis base of Suwa, apart from an improper hindsight reconstruction of present claims.

As to the present ranges of molar fraction of the respective monomeric units, the Examiner already established that Takemura's teaching renders present ranges *prima facie* obvious, and applicants have not provided on the record the showing of unexpected results of present ranges of molar fraction. Also, the Examiner already established one's motivation to add the phosphorus-containing oxoacid of Yoshimoto and the Lewis base of Suwa to Takemura's composition (i.e., one of ordinary skill in the art would be motivated to add an organic phosphorus acid compound such as phenylphosphinic acid or phenylphosphonic acid to Takemura's photoresist composition in order to improve the adhesiveness of the resist to the substrate as taught by Yoshimoto et al and also would be motivated to add Suwa's Lewis base (such as

triethylamine, tributylamine, or triethanolamine) to Takemura's photoresist composition in order to obtain the improved perpendicularity of resist pattern side walls as taught by Suwa et al). Also, the Examiner never stated that one of ordinary skill in the art would modify Takemura to discard its alkali-soluble resin or the dissolution inhibitor.

For the reasons stated above, present rejections still stand.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sin J. Lee whose telephone number is 571-272-1333. The examiner can normally be reached on Monday-Friday from 9:00 am EST to 5:30 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cynthia Kelly, can be reached on 571-272-1526. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

S. J. L.
S. Lee
October 24, 2004

Sin J. Lee
Sin J. Lee
Patent Examiner
Technology Center 1700